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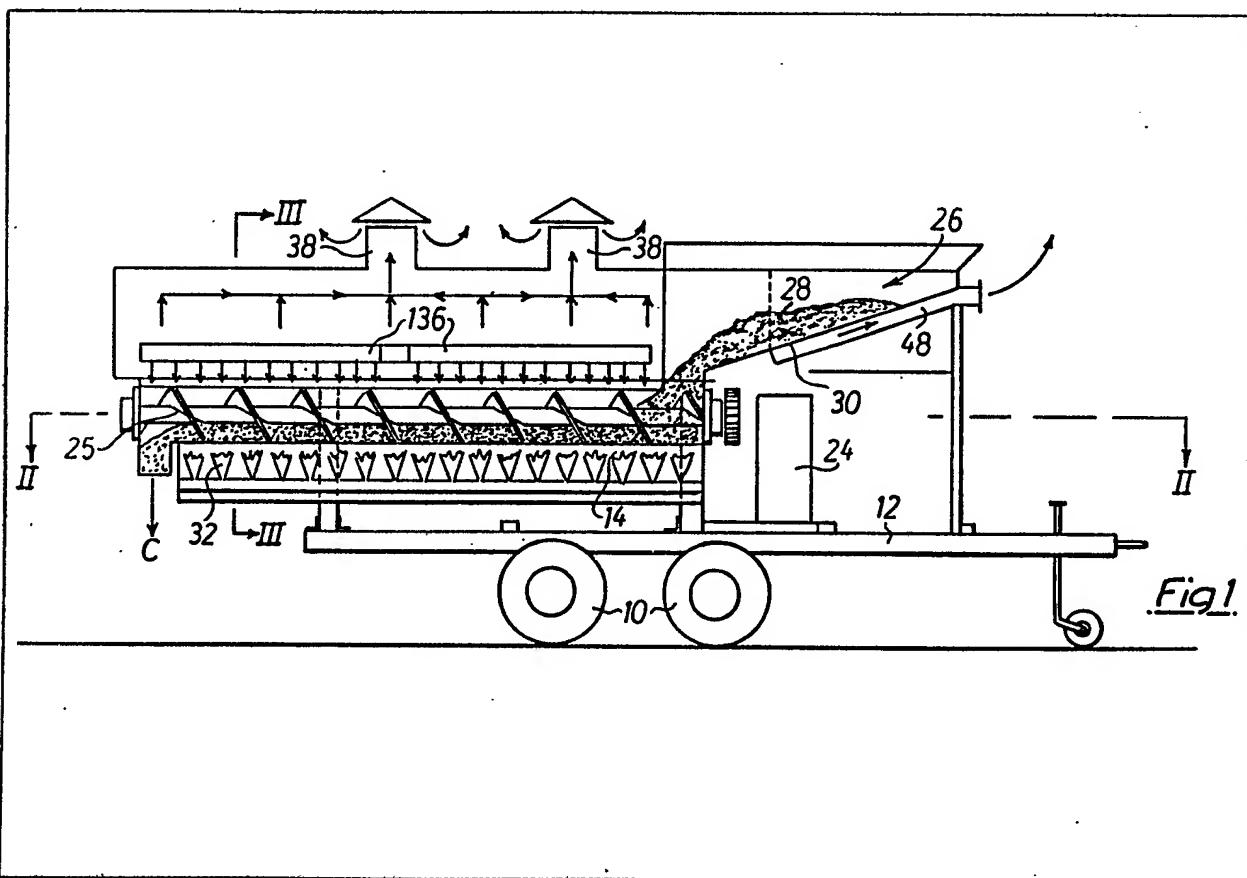
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(54) A highway asphalt and coated macadam recycling machine

(57) A recycling machine for highway asphalt and macadam has a trough-like container 14 for receiving reclaimed material from a reception

hopper 26. The material entering the container is broken up, mixed and conveyed to a discharge end of the container by one or more pluralities of generally helical paddle arrays 25.

During its passage along the container 14, the material is subjected to heating by means of a plurality of gas burners 32 which are directed against the underside of the trough 14 and by means of a plurality of radiant heaters 36 disposed above the trough. Neither of the latter heating arrangements subjects the contents of the container to naked flame.



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This print takes account of replacement documents later filed to enable the application to comply with the formal requirements of the Patents Rules 1982.

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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Fig. 1

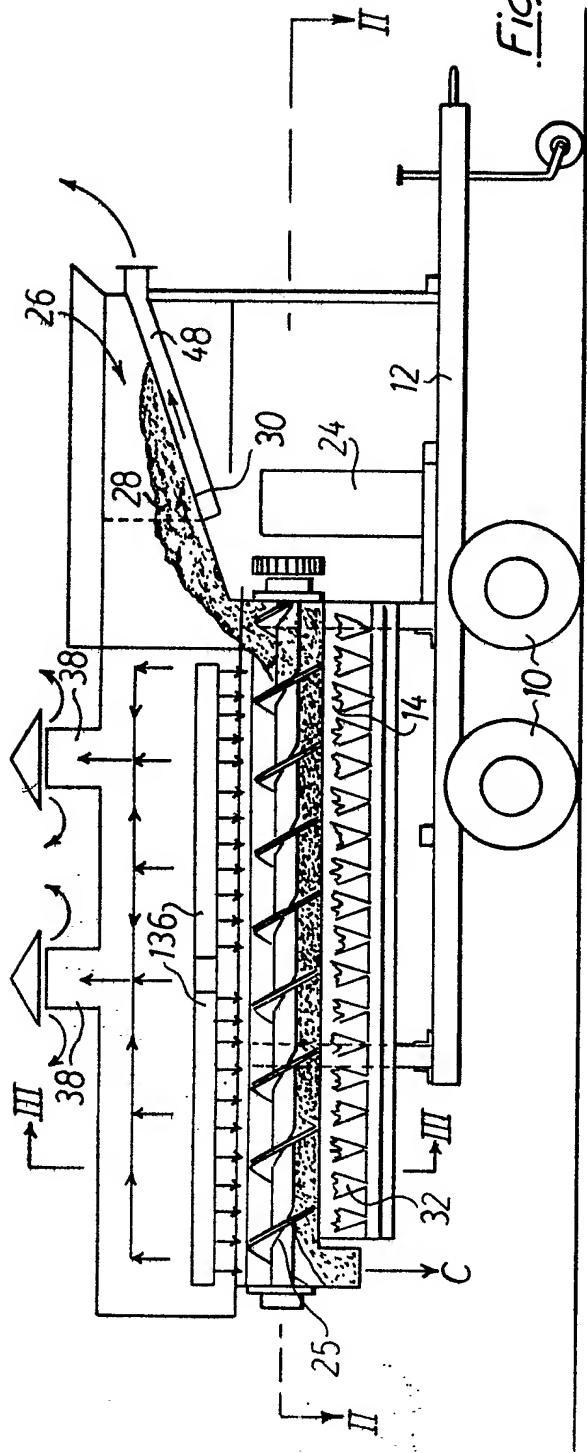
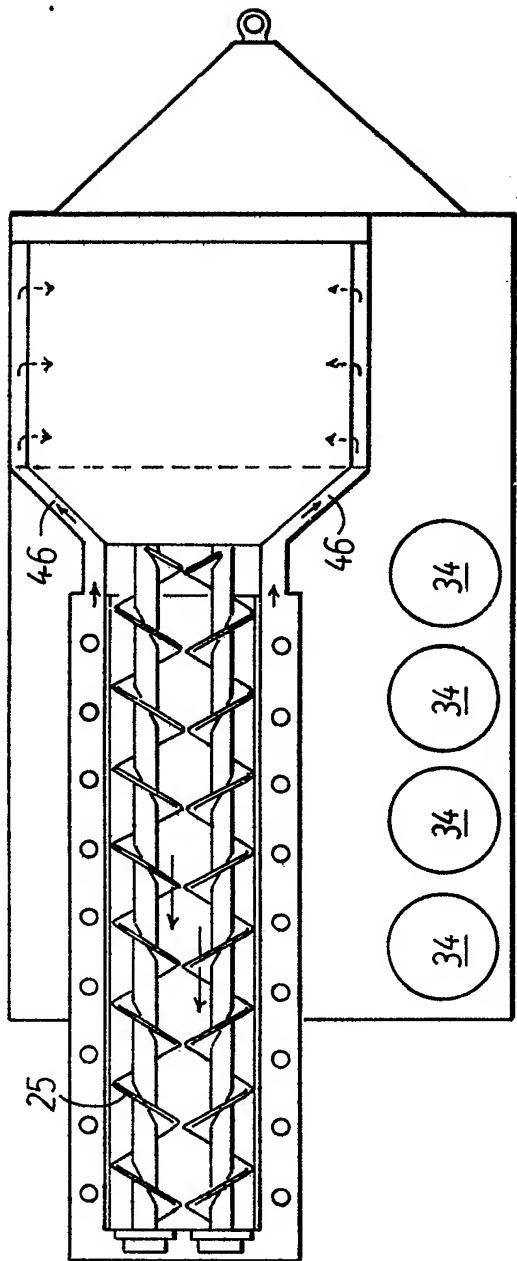


Fig 2



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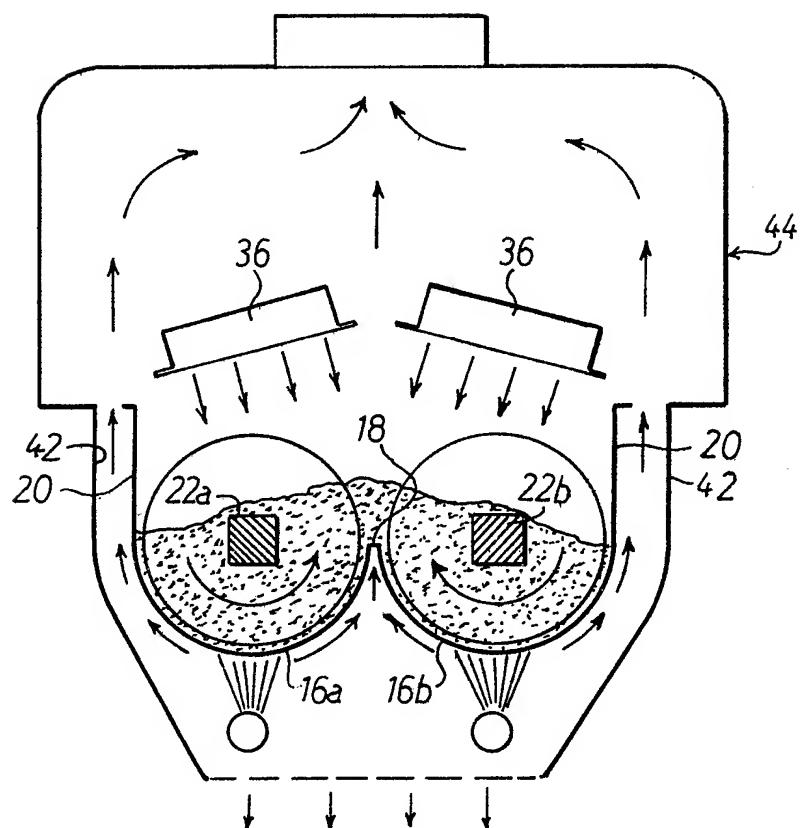


Fig 3.

SPECIFICATION**A highway asphalt and coated macadam recycling machine**

The present invention is concerned with
5 machines for enabling highway asphalt and
coated macadam to be recycled.

During the past few years Highway Surveyors
have been exploring alternatives to coated
macadam and asphalt made from new materials,
10 i.e. virgin stone and new bitumin or asphalt; some
plants in Europe and America have been either
modified or specifically designed to utilise various
percentages of scarifyings or old macadam or
asphalt. These plants invariably have taken the
15 form of twin drum dryer/mixers handling varying
percentages of used asphalt scarifying, generally
not more than 60/70%. The reason why 100% re-
claimed material could not be used in these
installations was due to the material having to
20 pass through a naked flame resulting in the
emission of blue smoke and an attendant fire risk.
This problem was overcome in the known
machines by feeding into the drum virgin stone
which was super-heated and then allowed to mix
25 with the re-claimed material at about the half-way
point of the rotating drum mixer, thus avoiding
contact between the flame and the re-claimed
material. Therefore by using that type of plant it
was found to be virtually impossible to re-cycle
30 100% re-claimed material.

It is a principal objective of the present
invention to provide a more effective means of
recycling re-claimed asphalt and/or macadam
which enables a greater proportion of re-claimed
35 material to be used, without losing any of the
advantages of the known drum method.

In accordance with the present invention, there
is provided a recycling machine for highway
asphalt and macadam comprising a container for
40 receiving re-claimed asphalt and/or macadam
material to be recycled, means in the container for
breaking up oversized pieces of said material,
mixing said material and conveying same to a
discharge end of the container, and a means for
45 heating said material in the container without
subjecting the material to naked flame.

Preferably, the container comprises an
upwardly open, elongate trough.
The heating means can include a plurality of
50 gas or oil burners disposed beneath the trough for
directly heating the underside of the trough base.

The heating means can also include one or
more radiant heaters disposed above the trough
for heating material in the trough from above.

55 Preferably, said means in the container for
breaking up, mixing and conveying the material
comprises a plurality of paddles carried by a
rotating or angularly reciprocating shaft.

One embodiment has a pair of said rotating or
60 reciprocating shafts which contrarotate, each said
shaft carrying its own plurality of paddles.

The invention is described further hereinafter,
by way of example only, with reference to the
accompanying drawings, wherein:

65 Fig. 1 is a diagrammatic sectional side elevation
of one embodiment of a machine in accordance
with the present invention;

Fig. 2 is a diagrammatic sectional plan view of
the machine of Fig. 1, taken on the line II—II; and

70 Fig. 3 is a diagrammatic sectional end elevation
of the machine of Fig. 1, taken on the line III—III.

The embodiment shown by way of illustration
in the drawings is designed for use as a mobile
recycling unit which can be towed or pushed on its
75 own wheels 10 to the site where there is a
demand for asphalt and/or macadam to be laid.
Other embodiments could, however, equally well
be designed for operation at a fixed site in which
case the wheels 10 would not be needed.

80 The unit has a rigid chassis 12 carrying an open
topped trough container 14 formed by a pair of
elongate tubs 16a, 16b of generally U-shaped
section which extend longitudinally of the
machine in side by side relationship, as best seen

85 in Fig. 3. The tubs 16a, 16b are interconnected
along their adjacent side edges as shown at 18,
the opposite sides of the tubs being continued
upwardly as indicated at 20 to define the side
walls of the trough. Disposed on the longitudinal

90 axis of each tub 16a, 16b is a respective shaft
22a, 22b, the latter shafts being adapted to be
contrarotated as indicated by the arrows A in
Fig. 3, by means of a diesel engine 24 and spur
gear arrangement (not shown in detail). Both

95 shafts 22a, 22b carry a plurality of paddles 25 (not
shown in detail) which are configured for
thoroughly breaking up and mixing particular
material introduced into the trough and for
gradually conveying such material towards a

100 discharge end (left-hand end in Fig. 1) of the
machine, as described further below.

The input end of the machine (right-hand end
as viewed in Fig. 1) includes a reception hopper or
hoppers 26 having a sloping base 30 for
105 introducing particulate material 28 fed thereto
into the upstream end of the mixing trough 14 as
indicated by arrow B in Fig. 1.

Disposed longitudinally beneath the trough 14
is a base heater which in this embodiment

110 comprises a plurality of gas burner jets 32 fed with
propane or butane gas from cylinders 34 stored at
one side of the chassis 12, as shown in Fig. 2. The
burners 32 could equally well be oil fired or
electric in other embodiments. As shown in the

115 drawings, the burners play directly on the base of
the trough 14 for assisting in heating the contents
to the desired temperature. Additional heating is
supplied by a plurality of radiant heaters 36
disposed above the trough 14 as shown in Figs. 1

120 and 3. The radiant heaters can also be gas
powered or they could be oil or electric. It will be
noted that in the case of both the base heaters
and the upper radiant heaters the contents of the
trough are not subjected to naked flame, the

125 heating being effected principally by way of hot
air.

A portion of the heat from the base burners
escapes to the atmosphere through upper exhaust
cowlings via further side passages 46 (Fig. 2) to a

plenum chamber 48 beneath the reception chamber 26 for the pre-heating of the chamber contents.

In use, re-claimed asphalt and/or macadam

- 5 removed from, for example, a section of highway to be resurfaced is introduced into the reception hopper 26 (together with binder material as necessary), where it is subjected to pre-heating by the hot exhaust gas in the plenum 48. The pre-
10 heated asphalt/macadam is passed under gravity (or in some cases by a vibratory feeder) into the upstream end of the trough 14 where it comes under the disintegrating, mixing and conveying action of the paddles carried by the shafts
15 22a, 22b. Although shown diagrammatically in the drawings as a continuous helical conveyor, the paddles 25 are preferably parts of a discontinuous helix whereby the individual paddles act as teeth or prongs which continually subject the mass of
20 asphalt/macadam to a breaking up and mixing action while at the same time gradually conveying same towards the discharge end of the trough. During this time, the asphalt/macadam is subjected to the heating effect of the base heaters
25 32 and the radiant heaters 36 whereby its temperature is raised to approximately 75°C, or above.

The reconstituted asphalt/macadam which discharges out of the downstream end of the trough (arrow C) can be applied directly to the road to be resurfaced or can be collected and transported to the re-surfacing location. In the case of a mobile machine, this could therefore be towed around with the road repairing team who could excavate the old asphaltic material and then by feeding the material into the recycling apparatus, adding any new binder as necessary, could have the availability of hot patching material to be laid immediately. This would considerably ease and improve the quality of the patching operation instead of having to rely on asphalt of storage grade, which does not usually provide good results. By the use, of the present apparatus particles constituted by 100% of re-claimed
45 material (disregarding any necessary binder) can be re-cycled.

Although the trough shown in the illustrated embodiment has two parallel tub components, it is not necessary for the trough to have this configuration and a single tube and single shaft or plural tubes with plural shafts could equally well be used, or the system could be Batch instead of continuous.

- 50 In other embodiments, the or each set of paddles could perform an oscillatory action (say through 200° angular movement) as compared with the fully rotary motion of the presently illustrated machine. In any event, the paddles must be capable of breaking down any oversized lumps of re-claimed material, of thoroughly mixing the resulting particles and of conveying such particles to the discharge end of the trough.
55
60

In addition to the re-claimed asphalt and/or macadam material supplied to the machine, a proportion of virgin aggregate can also be introduced as appropriate for the final product. Means can be provided for introducing additional bitumen, binder or rejuvenating agents, as necessary.

70 CLAIMS

- 1. A recycling machine for highway asphalt and macadam comprising a container for receiving reclaimed asphalt and/or macadam material to be recycled, means in the container for breaking up oversized pieces of said material, mixing said material and conveying same to a discharge end of the container, and a means for heating said material in the container without subjecting the material to naked flame.
- 2. A recycling machine as claimed in claim 1 wherein the container comprises an upwardly open elongate trough.
- 3. A recycling machine as claimed in claim 2 wherein the heating means includes a plurality of gas or oil burners disposed beneath the trough for directly heating the underside at the trough base.
- 4. A recycling machine as claimed in claim 3 wherein the heating means also includes one or more radiant heaters disposed above the trough for heating material in the trough from above.
- 5. A recycling machine as claimed in claim 2, 3 or 4 wherein said means in the container for breaking up, mixing and conveying the material comprises a plurality of paddles carried by a rotating or angularly reciprocating shaft.
- 6. A recycling machine as claimed in claim 5 wherein the container comprises a pair of parallel, side by side, open-topped tubs, each having its own plurality of paddles carried by a rotating or reciprocating shaft.
- 7. A recycling machine as claimed in claim 5 or 6 having a pair of said rotating or angularly reciprocating shafts which contra-rotate, each said shaft carrying its own plurality of paddles.
- 8. A recycling machine as claimed in claim 5, 6 or 7 wherein the shaft (or shafts) is driven by an engine via a gearbox.
- 9. A recycling machine as claimed in any of claims 1 to 8 further including a reception hopper for re-claimed material, the hopper being adapted to feed the latter material into the inlet end of the container.
- 10. A recycling machine as claimed in claim 9 including a vibratory feeding means for assisting flow of material from the hopper into the container.
- 11. A recycling machine as claimed in claim 9 or 10 including a plenum chamber adjacent the reception hopper, the plenum being arranged to receive hot exhaust gases from the heating means for pre-heating material prior to its entry into the container.

12. A recycling machine as claimed in any of
claims 1 to 11 having wheels to make it mobile.
13. A recycling machine for highway asphalt

and macadam, substantially as hereinbefore
5 described with reference to and as illustrated in
the accompanying drawings.

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